FIG. 1

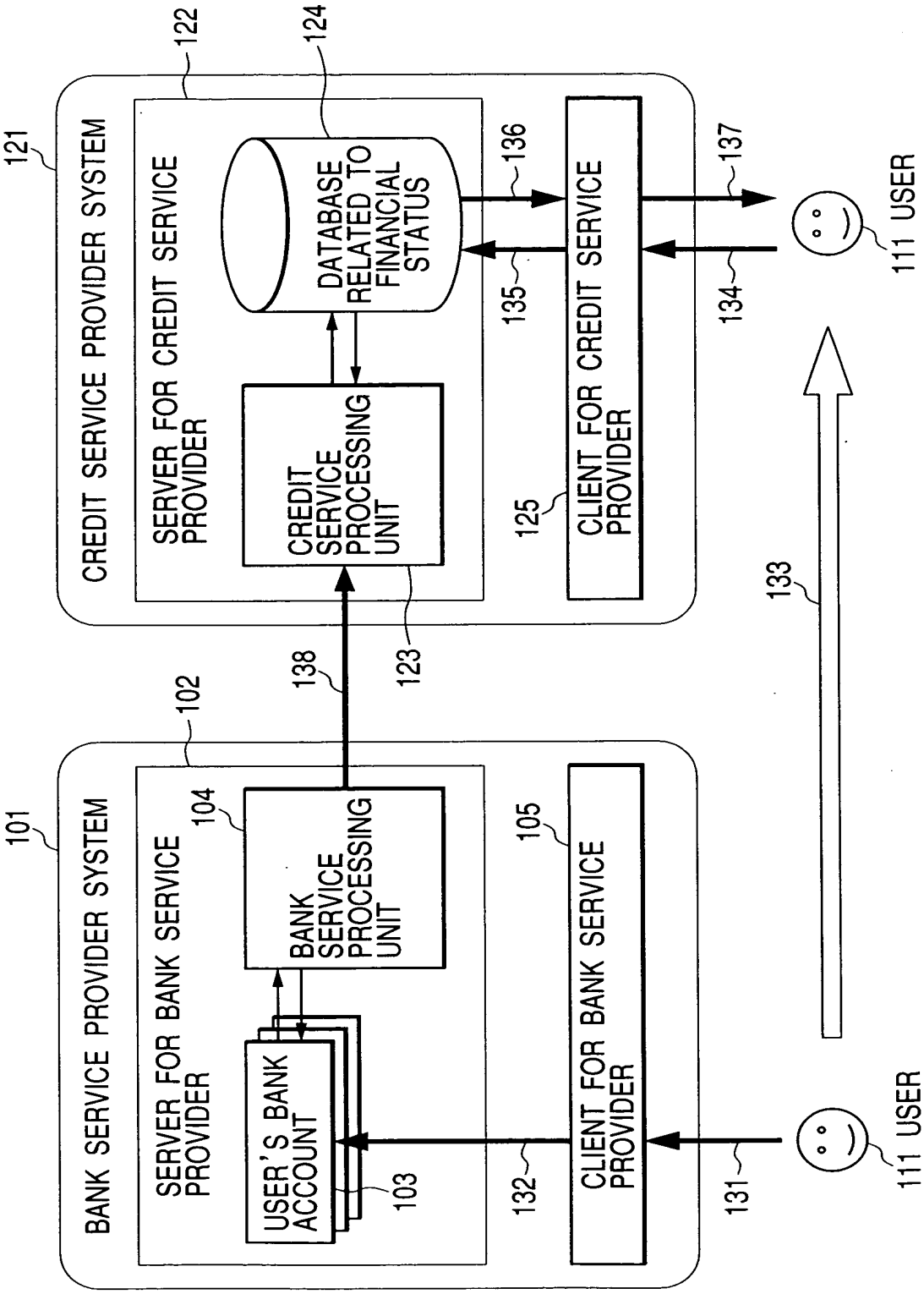

CREDIT SERVICE PROVIDER SYSTEM
121
SERVER FOR CREDIT SERVICE PROVIDER
122
DATABASE RELATED TO FINANCIAL STATUS
124
CREDIT SERVICE PROCESSING UNIT
123
CLIENT FOR CREDIT SERVICE PROVIDER
125
136
135
137
134
111 USER
BANK SERVICE PROVIDER SYSTEM
101
SERVER FOR BANK SERVICE PROVIDER
102
BANK SERVICE PROCESSING UNIT
104
USER'S BANK ACCOUNT
103
CLIENT FOR BANK SERVICE PROVIDER
105
132
131
111 USER
138
133

FIG. 2

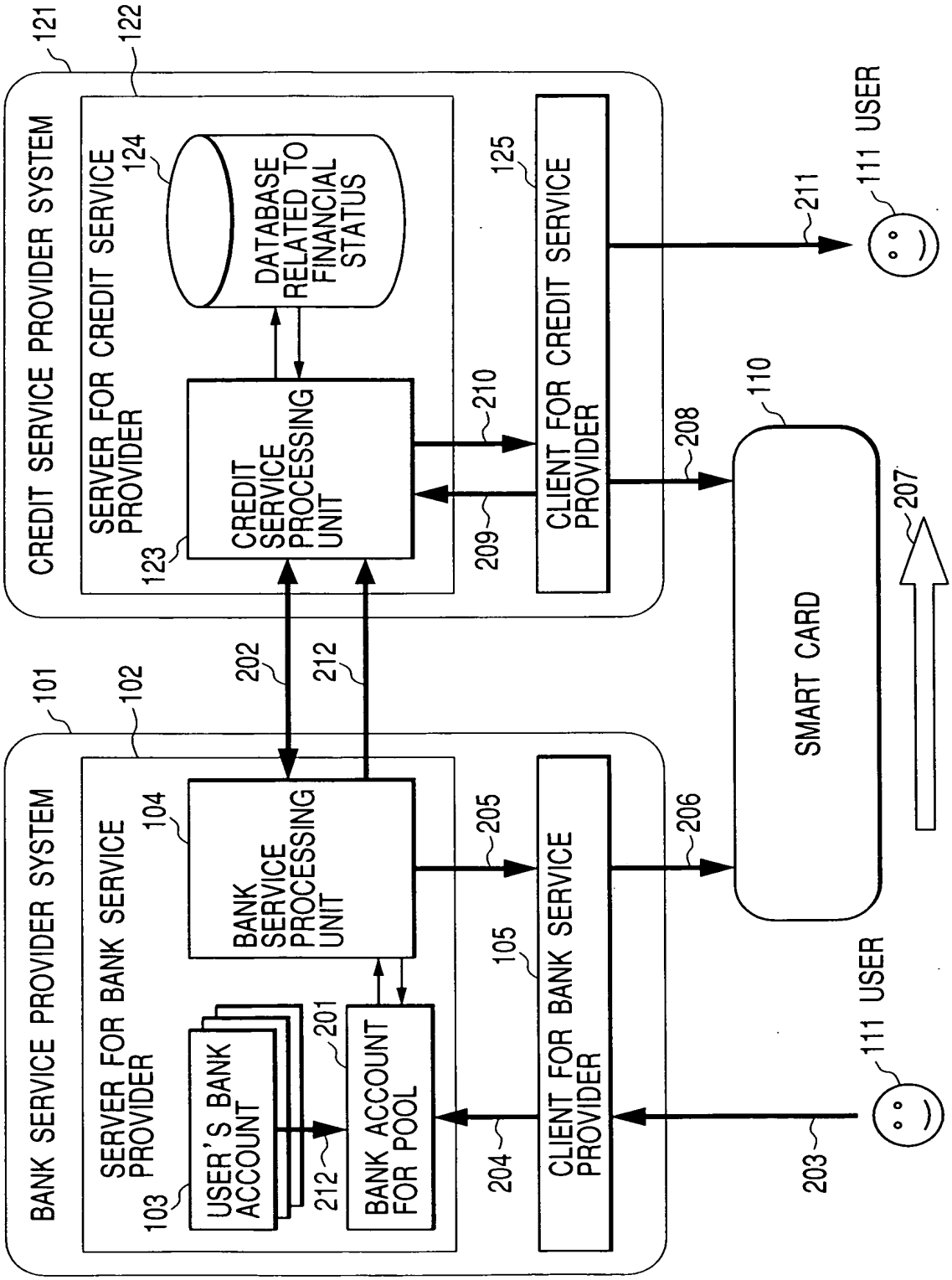

CREDIT SERVICE PROVIDER SYSTEM
121
SERVER FOR CREDIT SERVICE PROVIDER
122
DATABASE RELATED TO FINANCIAL STATUS
124
CREDIT SERVICE PROCESSING UNIT
123
CLIENT FOR CREDIT SERVICE PROVIDER
125
210
209
208
211
111 USER
110
SMART CARD
207
BANK SERVICE PROVIDER SYSTEM
101
SERVER FOR BANK SERVICE PROVIDER
102
BANK SERVICE PROCESSING UNIT
104
205
206
USER'S BANK ACCOUNT
103
201
212
BANK ACCOUNT FOR POOL
CLIENT FOR BANK SERVICE PROVIDER
105
204
203
111 USER
202
212

FIG. 3

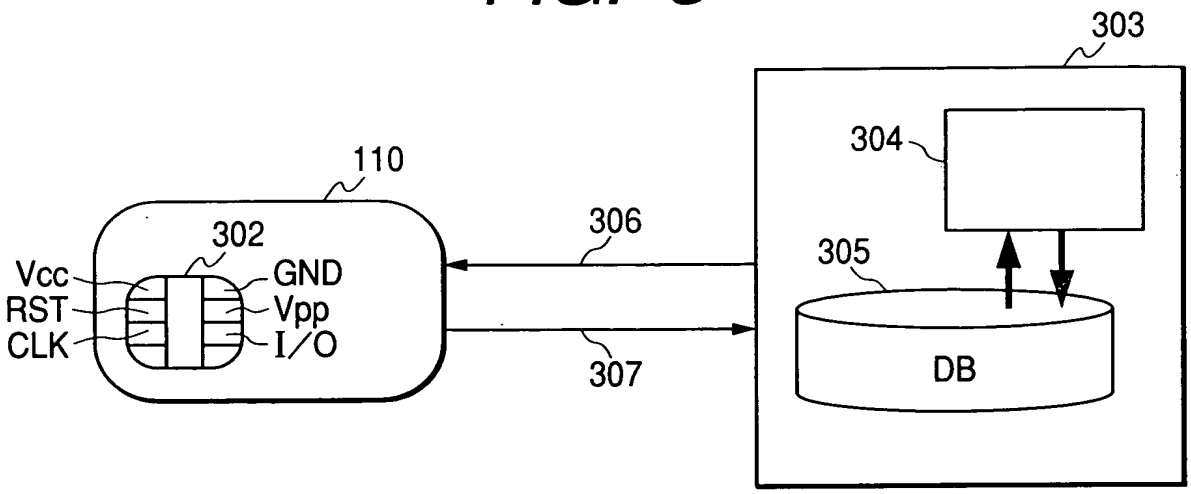

303
304
110
306
302
305
Vcc
GND
RST
Vpp
CLK
I/O
307
DB

FIG. 4

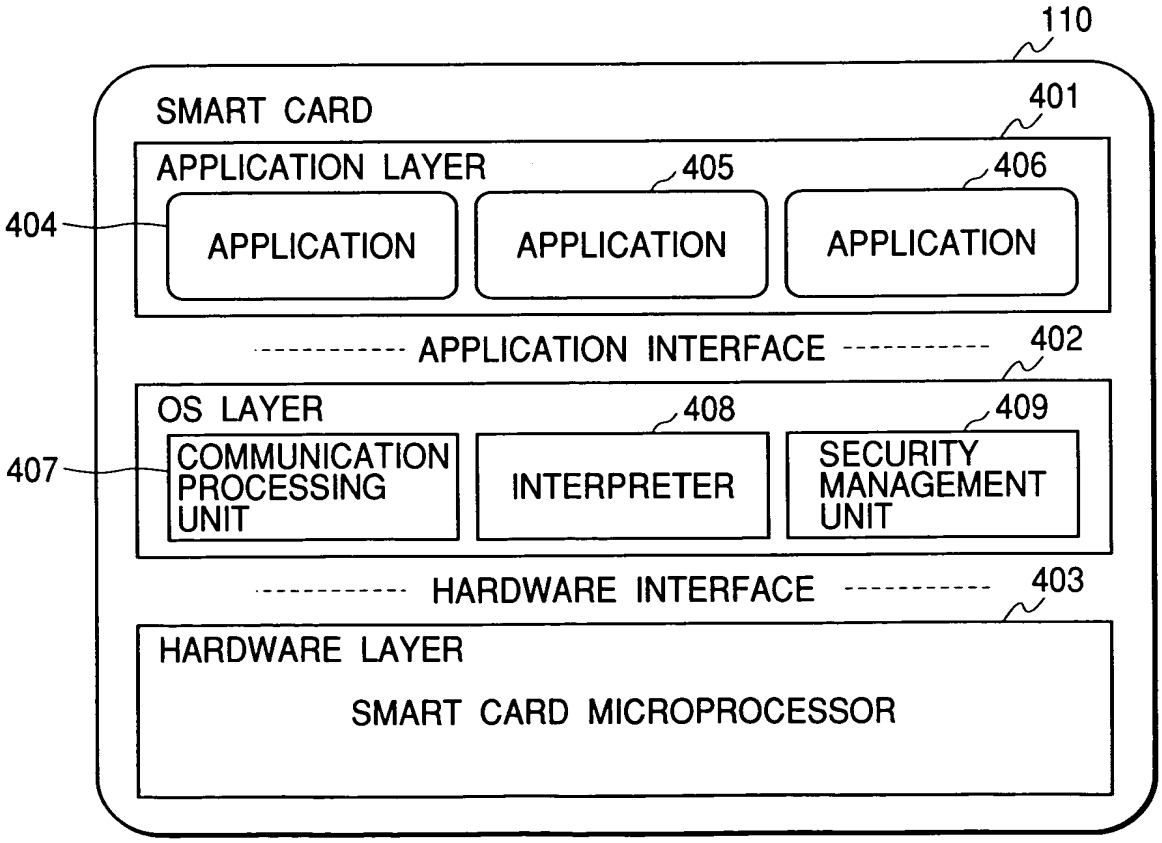

110
SMART CARD
401
APPLICATION LAYER
405
406
404
APPLICATION
APPLICATION
APPLICATION
APPLICATION INTERFACE
402
OS LAYER
408
409
407
COMMUNICATION PROCESSING UNIT
INTERPRETER
SECURITY MANAGEMENT UNIT
HARDWARE INTERFACE
403
HARDWARE LAYER
SMART CARD MICROPROCESSOR

FIG. 5

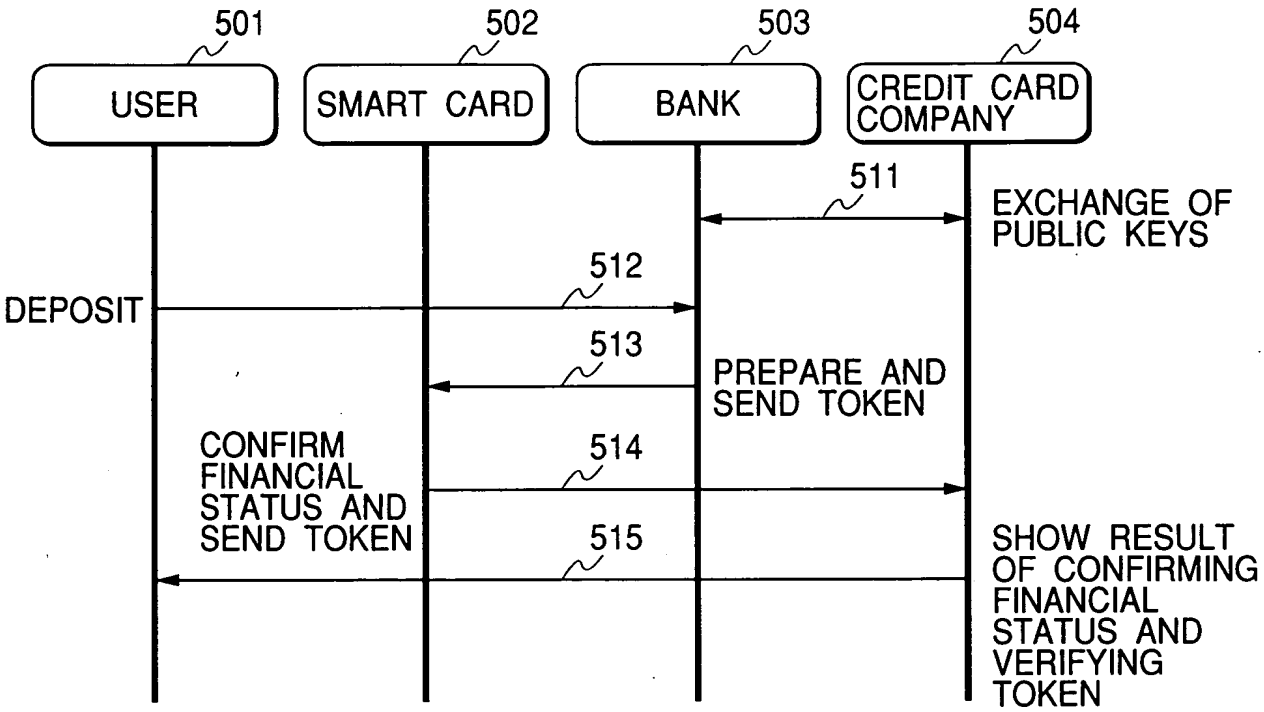

501
502
503
504
USER
SMART CARD
BANK
CREDIT CARD COMPANY
511
EXCHANGE OF PUBLIC KEYS
512
DEPOSIT
513
PREPARE AND SEND TOKEN
CONFIRM FINANCIAL STATUS AND SEND TOKEN
514
515
SHOW RESULT OF CONFIRMING FINANCIAL STATUS AND VERIFYING TOKEN

FIG. 6

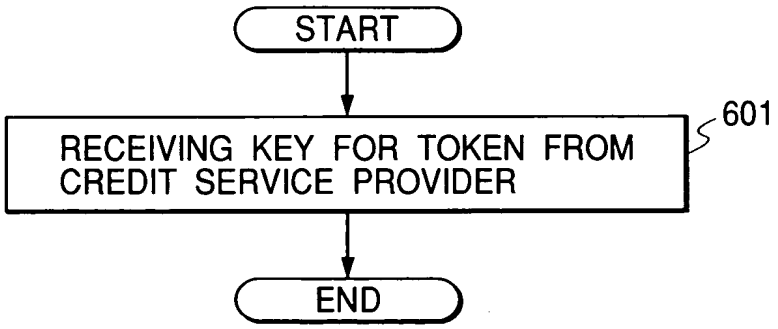

START
RECEIVING KEY FOR TOKEN FROM CREDIT SERVICE PROVIDER
601
END

FIG. 7

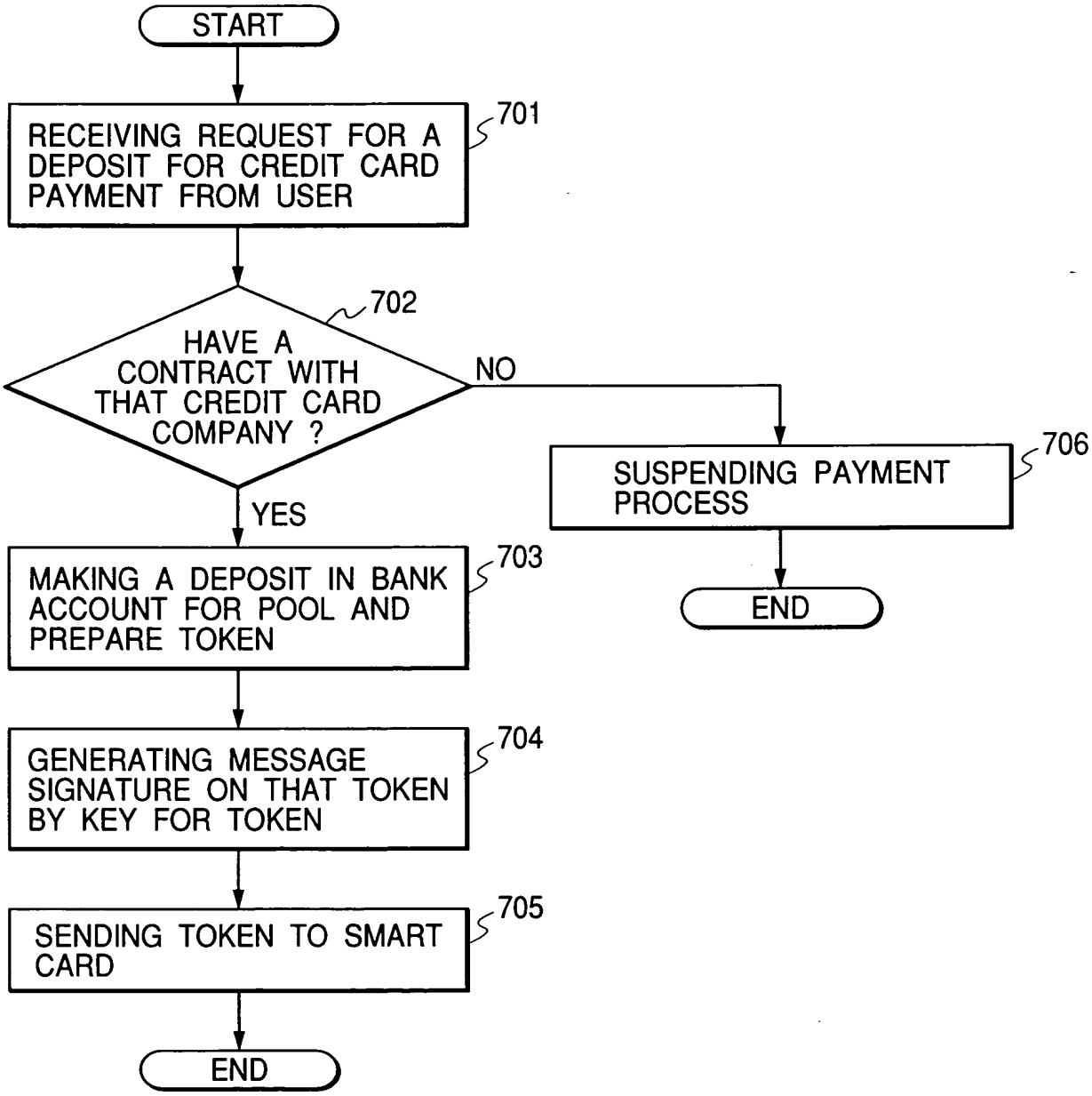

START
RECEIVING REQUEST FOR A DEPOSIT FOR CREDIT CARD PAYMENT FROM USER
701
HAVE A CONTRACT WITH THAT CREDIT CARD COMPANY ?
702
NO
YES
SUSPENDING PAYMENT PROCESS
706
END
MAKING A DEPOSIT IN BANK ACCOUNT FOR POOL AND PREPARE TOKEN
703
GENERATING MESSAGE SIGNATURE ON THAT TOKEN BY KEY FOR TOKEN
704
SENDING TOKEN TO SMART CARD
705
END

FIG. 8

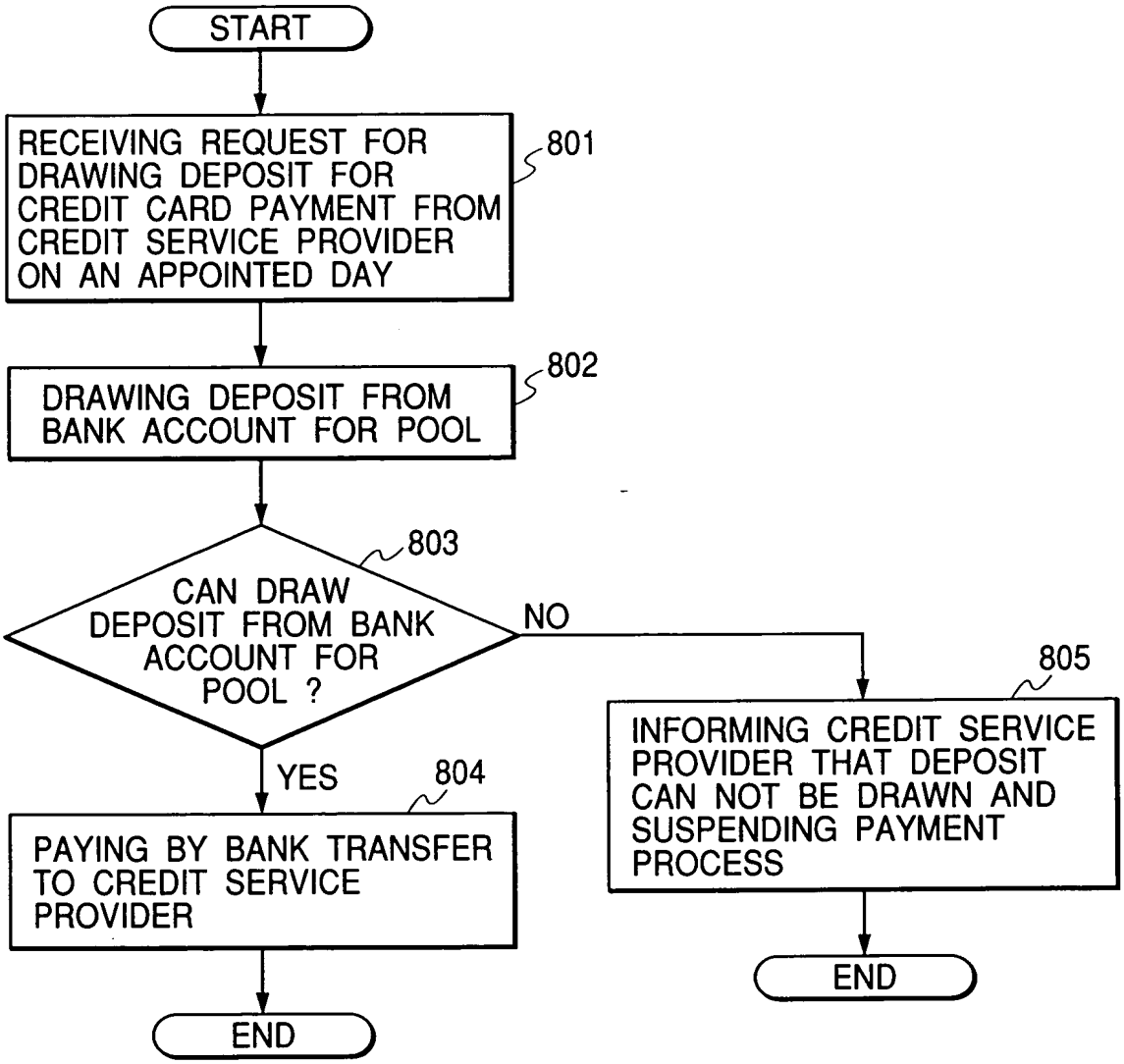

START
RECEIVING REQUEST FOR DRAWING DEPOSIT FOR CREDIT CARD PAYMENT FROM CREDIT SERVICE PROVIDER ON AN APPOINTED DAY
801
DRAWING DEPOSIT FROM BANK ACCOUNT FOR POOL
802
CAN DRAW DEPOSIT FROM BANK ACCOUNT FOR POOL ?
803
NO
YES
804
PAYING BY BANK TRANSFER TO CREDIT SERVICE PROVIDER
805
INFORMING CREDIT SERVICE PROVIDER THAT DEPOSIT CAN NOT BE DRAWN AND SUSPENDING PAYMENT PROCESS
END
END

FIG. 9

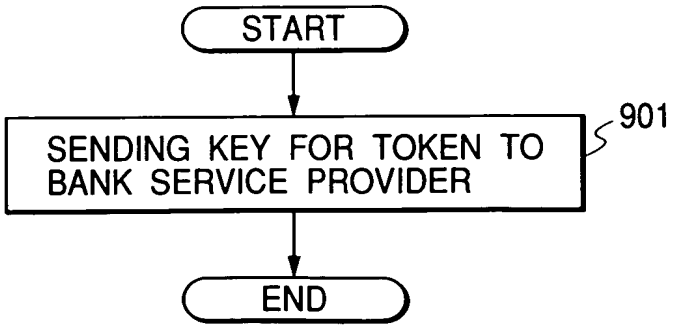

START
SENDING KEY FOR TOKEN TO BANK SERVICE PROVIDER
901
END

FIG. 10

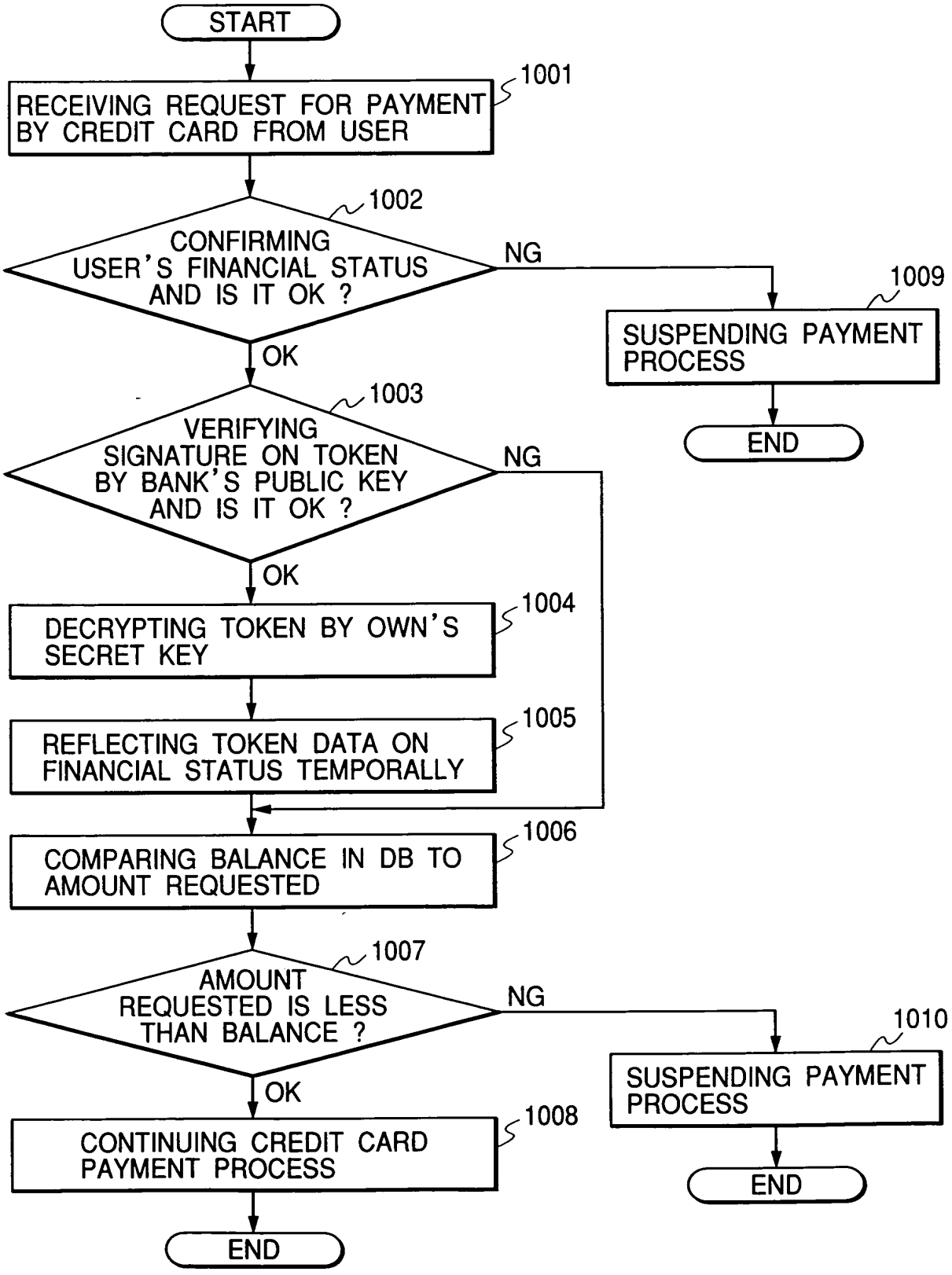

START
RECEIVING REQUEST FOR PAYMENT BY CREDIT CARD FROM USER
1001
CONFIRMING USER'S FINANCIAL STATUS AND IS IT OK ?
1002
NG
OK
SUSPENDING PAYMENT PROCESS
1009
END
VERIFYING SIGNATURE ON TOKEN BY BANK'S PUBLIC KEY AND IS IT OK ?
1003
NG
OK
DECRYPTING TOKEN BY OWN'S SECRET KEY
1004
REFLECTING TOKEN DATA ON FINANCIAL STATUS TEMPORALLY
1005
COMPARING BALANCE IN DB TO AMOUNT REQUESTED
1006
AMOUNT REQUESTED IS LESS THAN BALANCE ?
1007
NG
OK
SUSPENDING PAYMENT PROCESS
1010
END
CONTINUING CREDIT CARD PAYMENT PROCESS
1008
END

FIG. 11

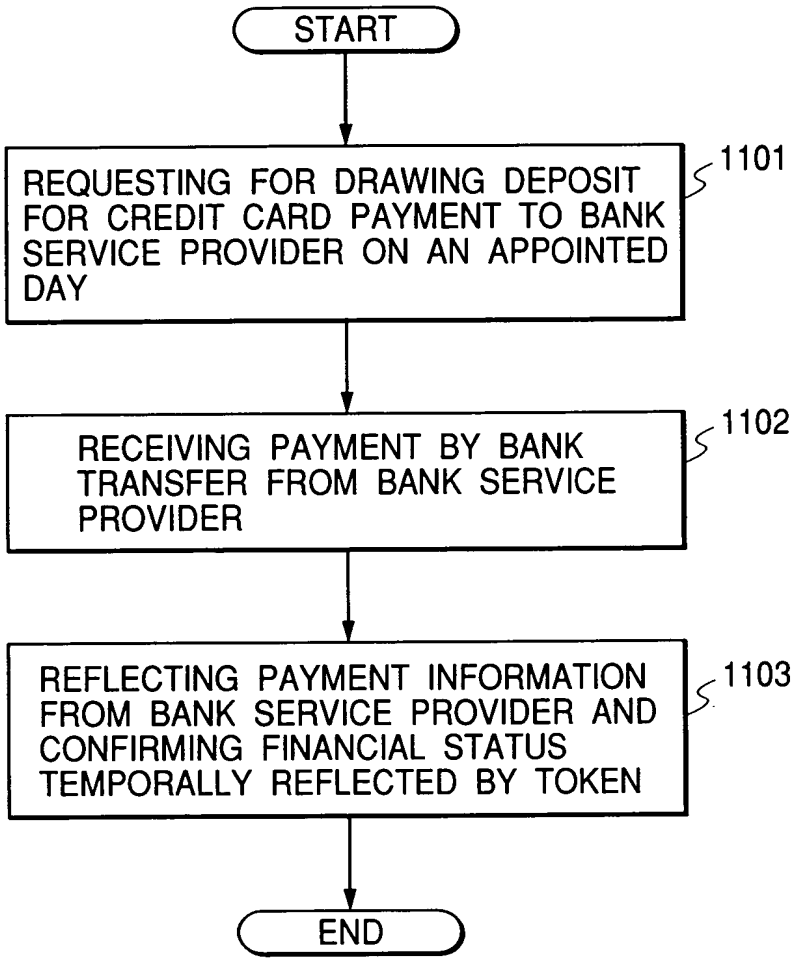

START
REQUESTING FOR DRAWING DEPOSIT FOR CREDIT CARD PAYMENT TO BANK SERVICE PROVIDER ON AN APPOINTED DAY
1101
RECEIVING PAYMENT BY BANK TRANSFER FROM BANK SERVICE PROVIDER
1102
REFLECTING PAYMENT INFORMATION FROM BANK SERVICE PROVIDER AND CONFIRMING FINANCIAL STATUS TEMPORALLY REFLECTED BY TOKEN
1103
END

FIG. 12

ITEM	EXAMPLE
USER NAME	TARO YAMADA
USER ID	1000000123
AMOUNT FOR DEPOSIT	$400
DATE OF DEPOSIT	2002/09/10
TOKEN ID	1234567890
EXPIRATION DATE OF TOKEN	2002/11/15
BANK ID	0001
BANK ACCOUNT	999123456
CREDIT CARD COMPANY ID	1111
CREDIT CARD NUMBER	1111222233334444

FIG. 13

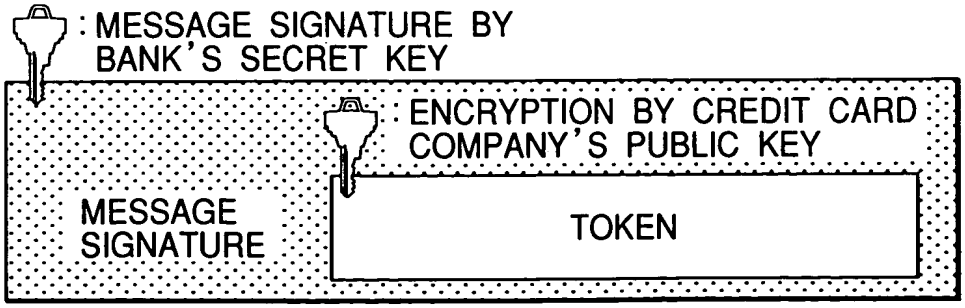


FIG. 14

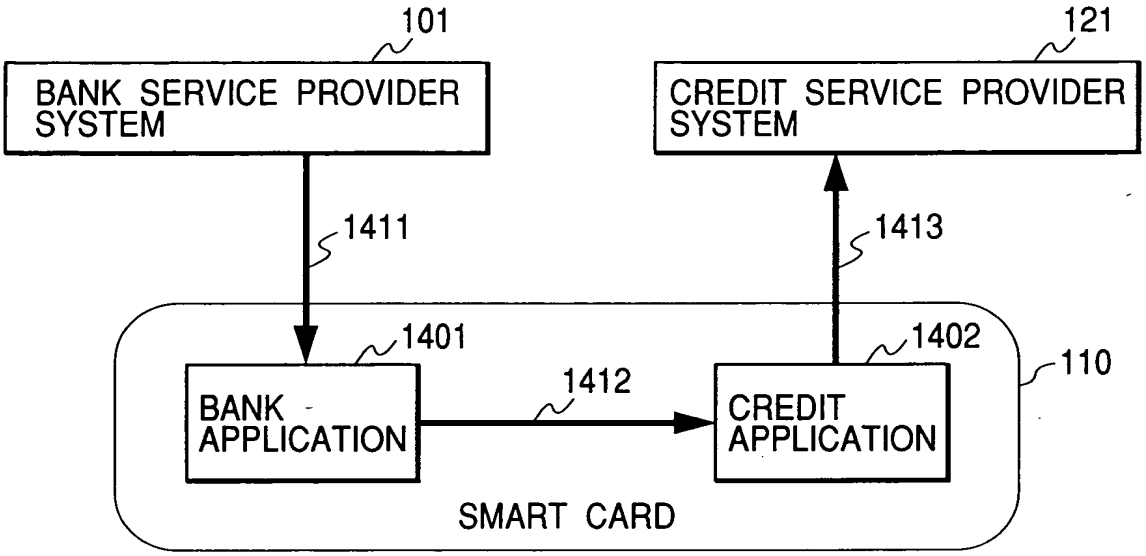
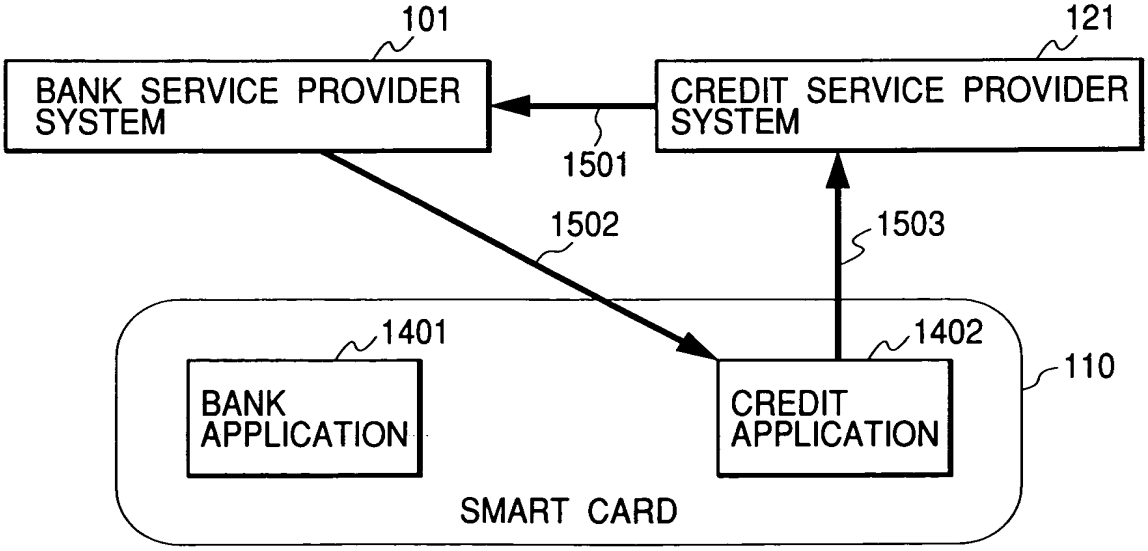

101
BANK SERVICE PROVIDER SYSTEM
121
CREDIT SERVICE PROVIDER SYSTEM
1411
1413
1401
1402
110
BANK APPLICATION
1412
CREDIT APPLICATION
SMART CARD

FIG. 15


101
BANK SERVICE PROVIDER SYSTEM
121
CREDIT SERVICE PROVIDER SYSTEM
1501
1502
1503
1401
1402
110
BANK APPLICATION
CREDIT APPLICATION
SMART CARD